

What is claimed is:

1. A friction stir welding method of joining an abutment portion by moving a rotating probe relatively along said abutment portion while pressing said probe against one surface of said abutment portion at which an end of a first plate member and an end of a second plate member are butted together, said friction stir welding method comprising the steps of:

attaching a buffer member to a backing jig which holds another surface of said abutment portion so that an opening of said backing jig formed corresponding to said abutment portion is covered therewith;

performing friction stir welding along said abutment portion by inserting said probe from said one surface of said abutment portion and deforming said buffer member and a part of said abutment portion to protrude toward said opening, while said first plate member and said second plate member are held by said backing jig; and

removing a portion protruding from said abutment portion toward said opening after performing said friction stir welding.

2. The friction stir welding method according to claim 1, further comprising the steps of:

disengaging only said backing jig from said abutment portion while said buffer member is forcibly secured to said

other surface of said abutment portion after performing said friction stir welding;

disengaging said buffer member from said other surface of said abutment portion; and

5 removing said protruding portion protruding from said abutment portion toward said opening.

3. The friction stir welding method according to claim 1, wherein said other surface of said abutment portion
10 is in close contact with an outer circumferential surface of said backing jig, and thus said ends of said first plate member and said second plate member have an identical length.

15 4. The friction stir welding method according to claim 1, wherein said backing jig has a completely circular outer circumferential surface, and said backing jig comprises a plurality of divided jigs and said divided jigs are movable back and forth in radial directions,

20 each of said divided jigs has a circumscribing recessed section which has a bottom communicating with said opening and which is provided corresponding to said other surface of said abutment portion, and

25 said ends of said first plate member and said second plate member which are in close contact with an outer circumferential surface of said backing jig have an identical circumferential length while said ring-shaped

buffer member is integrally attached to said respective recessed sections.

5 5. The friction stir welding method according to claim 3, wherein said first plate member and said second plate member are arranged on said backing jig while said first plate member and said second plate member are relatively expanded as compared with said backing jig.

10 6. The friction stir welding method according to claim 1, wherein said first plate member and said second plate member are welded by said friction stir welding along said abutment portion while a pressing force is applied in a direction substantially perpendicular to a direction of
15 insertion of said probe.

 7. The friction stir welding method according to claim 1, wherein each of said first plate member and said second plate member has a thickness of not more than 2 mm.

20 8. A friction stir welding method of joining an abutment portion by moving a rotating probe relatively along said abutment portion while pressing said probe against one surface of said abutment portion at which an end of a first
25 plate member and an end of a second plate member are butted together, said friction stir welding method comprising the steps of:

attaching a buffer member to a backing jig which holds another surface of said abutment portion corresponding to said abutment portion; and

performing friction stir welding along said abutment portion by inserting said probe from said one surface of said abutment portion and maintaining a tip of said probe at a position separated from said buffer member while said first plate member and said second plate member are held by said backing jig.

9. The friction stir welding method according to claim 8, further comprising the steps of:

disengaging only said backing jig from said abutment portion while said buffer member is forcibly secured to said other surface of said abutment portion after performing said friction stir welding; and

disengaging said buffer member from said other surface of said abutment portion.

10. The friction stir welding method according to claim 8, wherein said other surface of said abutment portion is in close contact with an outer circumferential surface of said backing jig, and thus said ends of said first plate member and said second plate member have an identical length.

11. The friction stir welding method according to

claim 8, wherein said backing jig has a completely circular outer circumferential surface, and said backing jig comprises a plurality of divided jigs and said divided jigs are movable back and forth in radial directions, and

5 each of said divided jigs has a circumscribing recessed section which is provided corresponding to said other surface of said abutment portion, and said ends of said first plate member and said second plate member which are in close contact with an outer circumferential surface of said
10 backing jig have an identical circumferential length while said ring-shaped buffer member is integrally attached to said recessed sections.

12. The friction stir welding method according to
15 claim 10, wherein said first plate member and said second plate member are arranged on said backing jig while said first plate member and said second plate member are relatively expanded as compared with said backing jig.

20 13. The friction stir welding method according to claim 10, wherein said first plate member and said second plate member are welded by said friction stir welding along said abutment portion while a pressing force is applied in a direction substantially perpendicular to a direction of
25 insertion of said probe.

14. The friction stir welding method according to

claim 8, wherein each of said first plate member and said second plate member has a thickness of not more than 2 mm.

15. A friction stir welding apparatus for joining an abutment portion by moving a rotating probe relatively along said abutment portion while pressing said probe against one surface of said abutment portion at which an end of a first plate member and an end of a second plate member are butted together, said friction stir welding apparatus comprising:

a backing jig which holds another surface of said abutment portion where said first plate member and said second plate member are arranged and which is to be disengaged from said other surface of said abutment portion after performing friction stir welding,

said backing jig including a recessed section which corresponds to said other surface of said abutment portion, and an opening which is communicated with a bottom of said recessed section,

wherein a buffer member, which is to be disengaged from said other surface of said abutment portion after performing said friction stir welding, is attached to said recessed section, and

said buffer member and a part of said abutment portion are deformed to protrude in said opening during said friction stir welding.

16. The friction stir welding apparatus according to

claim 15, wherein said other surface of said abutment
portion is arranged in close contact with an outer
circumferential surface of said backing jig, and thus said
ends of said first plate member and said second plate member
5 have an identical length.

17. The friction stir welding apparatus according to
claim 15, wherein said backing jig has a completely circular
outer circumferential surface, and said ends of said first
10 plate member and said second plate member, which are fitted
to and in close contact with said outer circumferential
surface, have an identical circumferential length.

18. The friction stir welding apparatus according to
15 claim 17, wherein said backing jig is provided with a
plurality of divided jigs and said divided jigs are movable
back and forth in radial directions; and

said buffer member has a ring-shaped configuration
capable of being integrally fitted to respective recessed
20 sections which are formed on said respective divided jigs.

19. The friction stir welding apparatus according to
claim 15, further comprising a pressing mechanism which
applies a pressing force to said first plate member and said
25 second plate member in a direction substantially
perpendicular to a direction of insertion of said probe.

20. The friction stir welding apparatus according to claim 15, wherein each of said first plate member and said second plate member has a thickness of not more than 2 mm.

5 21. A friction stir welding apparatus for joining an abutment portion by moving a rotating probe relatively along said abutment portion while pressing said probe against one surface of said abutment portion at which an end of a first plate member and an end of a second plate member are butted
10 together, said friction stir welding apparatus comprising:

a backing jig which holds another surface of said abutment portion where said first plate member and said second plate member are arranged and which is to be disengaged from said other surface of said abutment portion
15 after performing friction stir welding,

said backing jig including a recessed section which is provided corresponding to said other surface of said abutment portion,

20 wherein a buffer member, which is to be disengaged from said other surface of said abutment portion after performing said friction stir welding, is attached to said recessed section.

25 22. The friction stir welding apparatus according to claim 21, wherein said other surface of said abutment portion is arranged in close contact with an outer circumferential surface of said backing jig, and thus said

ends of said first plate member and said second plate member have an identical length.

23. The friction stir welding apparatus according to claim 21, wherein said backing jig has a completely circular outer circumferential surface, and said ends of said first plate member and said second plate member, which are fitted to and in close contact with said outer circumferential surface, have an identical circumferential length.

24. The friction stir welding apparatus according to claim 23, wherein said backing jig is provided with a plurality of divided jigs and said divided jigs are movable back and forth in radial directions, and

said buffer member has a ring-shaped configuration capable of being integrally fitted to respective recessed sections which are formed on said divided jigs.

25. The friction stir welding apparatus according to claim 23, further comprising a pressing mechanism which applies a pressing force to said first plate member and said second plate member in a direction substantially perpendicular to a direction of insertion of said probe.

26. The friction stir welding apparatus according to claim 23, wherein each of said first plate member and said second plate member has a thickness of not more than 2 mm.